

Some of Ecological and Blood Parameters Aspects for common carp *Cyprinus carpio* L. Rearing in Earth Ponds using different Water Resources at Babylon Governorate / Middle of Iraq

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Abstract

The current study focused on some of ecological and physiological aspects of common carp, *Cyprinus carpio* L., reared in earthen ponds with three different water sources from Euphrates River, drainage water and wells. This study was conducted for two seasons, during May and November 2023. The highest water temperature of 26°C recorded during May for draining water and the lowest of 21.5°C during November for Euphrates River and Wells. The highest concentration of dissolved oxygen was 6.5 mg/L during November for Euphrates River, and the lowest was 4 mg/L during May for drainage water. Some of blood parameters were measured, and ranging for red blood cell (RBC) between 1 to 1.2 (cell x 10⁶), white blood cells (WBC) between 8.1 to 8.9 (cell x 10³), packed cell volume (PCV%) between 30 to 32 and hemoglobin (Hb) between 10.8 to 11.5 (g/IU) during May 2023. Whereas, during November the values were ranging for RBC from 1.2 to 1.8 (cells x 10⁶), WBC from 8.7 to 13 (cells x 10³), PCV% from 35 to 46 and Hb from 11.9 to 16 (g/IU). The current results indicate that the water of Euphrates River was suitable for the growth and more comfortable for fishes, followed by well water compar with drainage canals water.

Keywords: *Cyprinus carpio* L., Blood parameters, Water quality

Introduction

Water body is one of the largest ecosystems and constitutes 71% of the Earth's surface area, more than 69 fish species were founded at Iraqi inland water. Of these, fishes for Cyprinidae are the most important economically in individual numbers and weights [1]. Fish health status was affected by Water quality changes, and may suffer and died in its environment, or may be risk through food chain, reaching humans [2]. Blood parameters are the most important physiological measurements for fish health investigation, of these parameters are red

blood cells (RBC), white blood cells (WBC), parked cell volume (PCV) and hemoglobin (hemoglobin) Hb concentration [3].

Fish as sources of animal protein containing essential of necessary amino acids and mineral elements and salts for human healthy [4]. Common carp, *Cyprinus carpio*, is one of the most important species of freshwater fish due to its adaptation and tolerance to wide changing in environmental conditions, wide range of food diversity and its rapid growth [5]. Unfortunately, a little of studies deals with fish blood parameters raring at different water

quality. Therefore, this study was focused on some of fish blood parameters. These fishes were rearing in different water quality, during May (cultured season) and November (harvest season) 2023 at Al-Musayyib District/ Babil Governorate/ Iraq. This research aimed to study the environmental changes in water quality and the effect of these changes on the fish blood parameters during the study period.

Materials and methods

Description of the study area

The effect of water quality from three different sources was conducted for common carp *Cyprinus carpio* rearing in earthen ponds. This study has done at Al- Musayyib District / Babylon Governorate/Iraq (32.7786 °N 44.29 °E). Water sources were supplied from Euphrates River, draining water and from Wells. The area of each earthen pond was 7 acres (with 3 replicate for each treatments). A sampling of water and fishes were taken during two seasons at 2023, first at May season of fish cultured (individual weight of 100 ± 5 gm) and at November the season of fish harvested (individual total weight range between 1500 to 2000 gm). Culture densities of 750 fish per acres were used. The earthen ponds basins were a rounded by village within different of agriculture and humanity activities. At present study fishes rearing in earthen ponds from different water sources were fed by using same commercial floating diet (Al-Taleby Feed Company /Babylon Province). Floating pellets size ranging between 3 to 6 mm In conjunction with the growth of fishes. The composition components of percentages according to brand label, namely protein 15%, soybean meal 25%, yellow corn 14%, barley 18%, wheat bran 25%, salts and vitamins 2%, and garlic

powder 1% (protein percentage of 30% and energy of 2700 kilocalories/100g feed.)

Some of Physical and chemical characteristics for water

Water characteristics were done during early morning hours from depth of 15 cm from surface. Temperature was measured using simple mercury thermometer (from 0 to 100 °C). Dissolved concentration oxygen (mg/l), salinity (mg/L) and pH (after calibrating it using standard buffer solutions with pH 4, 7, and 10) were measured using a portable malty parameters (Martini Instrument Model 180 Mi-Italy.)

Fish samples

A total of 180 specimens of fishes were collected (within 90 specimens per season, 30 samples per treatment and 10 sample per pond). Fishes were caged and transported directly with plastic container to the laboratory.

Blood parameters

Blood samples from fish caudal vein were taken, using a plastic syringe of 3 ml. Red (RBC) and white (WBC) blood cells were counted according to Blaxhall and Daisley [6]. The packed blood cell volume (PCV %) was measured by Microhaematocrit Reader according to Klontz [7]. Blood hemoglobin (Hb) was calculated using a VEGASYS Chemical Analyzer (Italian AMS Comp.) with a wavelength of 540 nm according to Roche [8.]

Statistical Analysis

Using Statistical Analysis System - SAS (2018) to analyze the data to study the effect of varying water quality on some physiological characteristics of fish, and the significant differences between the means were compared using the Duncan test [9.]

Results and discussion

Some physical and chemical characteristics of water

Water quality plays an important role as determining factors for fish ecology and biology; these reflect its comfortable condition factors for its ecosystems [10].

From table (1), water characteristics showed significant differences ($P \leq 0.05$) during May (cultured season) and November (harvest season) 2023. The highest water temperature was 25.7 °C recorded during May for draining water and the lowest of 24.7 °C for wells, compared with Euphrates River. Water temperatures were significantly ($P \leq 0.05$) higher during May more than November. The present results are closely from the study of Mustafa [11] who recorded fluctuation in water temperature during different months at different locations for Tigris and Euphrates Rivers. Fish growth and health were affected by these changes in temperature during warm and hot season. These changes may due to daylight hours during hot months, light transmittance and the quality and quantity of suspended materials, as well as, water levels [4].

Most ecological studies in Iraqi waters, represented by the Tigris and Euphrates rivers, indicate that water temperatures rise during the summer months and decrease during the winter months [12]. The current results agreed with Haitham and Hassan [13] study on the effects of climate, seasons, and water quality on the water temperatures of earthen basins in different regions of Iraq. Our results were recorded significantly ($P \leq 0.05$) highest values of dissolved oxygen concentration for Euphrates River of 5.5 and 6.5 mg/L during May and November respectively, compared to the lowest values of 4 and 4.5 mg/L for

drainage water during for same seasons respectively. These results may show related in relationship between temperature and O₂ concentration. The increase in water temperatures may lead to the evaporation of water, with dissolution of organic materials, as well as an increase in the metabolic activities of aquatic organisms that need to consume more dissolved oxygen [14]. Most of past native studies indicated that water quality of Euphrates River is good aeration and comfortable for fish ecology, biology and physiology, compared to quality for wells and then draining water [5 ; 4]. Water salinity recorded significant values ($P \leq 0.05$) for draining water of 1.3 g/L during May, and the lowest for Euphrates River water of 0.2 g/L during the November, comparing with wells water which came between them. The effluents of in human activities, as, farming, plant fertilization may increasing in salt water concentration neighboring field farm [15]. The current results may agree with the study of Haitham and Hassan [13] that indicated an increasing in salinity water during hot months and decreasing during cold months at some of inland water in Iraq. The present results showed that Euphrates River was among the fresh waters comparing with brackish water for wells and draining water [12; 4]. The current results were recorded a significant difference ($P \leq 0.05$) in pH values. The highest was 7.2 and recorded for Euphrates River during May, followed by decreasing in values during November of 6.1 for Welles and finally of 4.2 for draining water during November. Our results were noted that increasing in pH values during May season of cultured fish comparing with November season of harvest fish. These fluctuations in pH values for waters of Euphrates River draining and Welles during May and November may due to the

activities of fertilization for field crops during warm months. Good aeration of water for Euphrates River within abundance in dissolved oxygen, maybe the reason to found heights pH values, comparing with decreasing slow velocity of water and photosynthesis with increasing in carbon dioxide for Welles and draining water [16].

Fish blood parameters

Blood parameters study are among the most important physiological measurements to determine the health status of fish, sometimes used as indicators when fish are exposed to any environmental stress when emergency changes occur in the water body [4].

The results of Table (2) indicated slight, non-significant changes in the values of blood parameters for fish raised in three types of water during the month of May (culture season). While significant changes ($p \leq 0.05$) were recorded for the values for the fish harvest season, and the month of November witnessed the highest significant increase ($p \leq 0.05$) for drain water. The number of RBC was 1.7×10^6 , WBC count was 12.9×10^3 , and PCV was 45.3%, and Hb is 15.8 g/IU. While it gradually decreased for the other two water types, recording the lowest for fish in the Euphrates River waters, RBC were 1.3 cells $\times 10^6$, WBC were 8.8 cells $\times 10^3$, PCV was 35.7%, and Hb was 11.9 g/IU. The present results of blood parameters were showed increasing in values and recorded the highest for RBC, WBC, PCV, and Hb during November 2023 (harvest season) for drainage and Welles water followed by Euphrates River, comparing with the results which recorded during May (cultured season). An increase in blood parameters for common carp may relate with changes in water temperatures, depending on daylight hours. In addition, the increasing in blood parameters

were shown for fish of in the draining water, then Welles water and finally the lowest for Euphrates River.

Fishes in its ecosystems may affected by changes in water quality. Water contamination with heavy meatal pollutants, wastes and toxins may follow toward draining water. As well as, decrease in water levels, fluctuations in water temperature during different seasons which may cause decrease in breathing efficiency for fishes. For different changes in water ecosystem, Fish may face stressing, and as resistance, fish will tried to get more oxygen to its demanding [17]. From present results water for Euphrates River was better and comfortable for fish more than Welles and draining water. Fishes in draining water may exposure to stress by pollutants, decreasing in oxygen and pH levels, as the activity for agriculture, manufactures and human [16]. Insecticides and plant pesticides activity which used around area of ponds may increase stress for fish within increasing in blood parameters values. All these factors affected water quality which as bad environmental conditions for fish health, on the other said, decreasing in dissolved oxygen amount consumed by fishes may cause breathing stress with low immune defenses to resist diseases and pollutants, till fish will be confused [18].

Aliwi et. al. [4] noticed that increasing in blood parameters as indicators for non-healthy fish statues. It may closer for our results for fishes in draining water. Abbas et. al. [15] showed that fishes at Tigris River before Al-Kut Barrage were better in healthy more than the same fish species which cached after Barrage which exposure for different pollutant. In our study, draining water was received all effluents from area around ponds, which current different agricultural residues as well as discharges from civilian activities. On

the other hand, Welles water may exposure for these discharge activities when across throw different canals nearby field reaching ponds, The present study noticed that water from Euphrates River is more comfortable for fish

health, followed then by Welles water, and at least draining water is worse for fish farming

Table 1. : Some of water characteristic (average values \pm sd) for common carp *C. carpio* rearing in earthen ponds for different water sources at Babylon Governorate/ Iraq during May (cultured season) and November (harvest season) 2023

Water source	Water characteristic							
	Water temperature (°C)		Dissolved oxygen (mg/L)		Salinity (g/l)		pH	
	May	November	May	November	May	November	May	November
Euphrates River	25.3 \pm 0.2	22.0 \pm 0.3	5.5 \pm 0.1 *	6.5 \pm 0.0 *	0.5 \pm 0.03	0.2 \pm 0.03	7.2 \pm 0.1 *	6.5 \pm 0.03 *
Drainage water	25.7 \pm 0.2	21.8 \pm 0.4	4.0 \pm 0.03 *	4.5 \pm 0.03 *	1.3 \pm 0.1 *	0.9 \pm 0.03 *	5.1 \pm 0.1 *	4.2 \pm 0.2 *
Wells water	24.7 \pm 0.3 *	22.5 \pm 0.6	5.0 \pm 0.1 *	6.0 \pm 0.1 *	0.5 \pm 0.03	0.2 \pm 0.03	6.2 \pm 0.1 *	6.1 \pm 0.1 *

*Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan multiple ranges test at significant level of 5%.

Table (2): Some of blood parameters (average values \pm sd) for common carp *C. carpio* rearing in earthen ponds for different water sources in Babylon Governorate/ Iraq during May (cultured season) and November (harvest season) 2023

Water sources	Blood Parameters							
	Red blood cells Cell x 10 ⁶		White blood cells Cell x 10 ³		Packed volume PCV %		Hemoglobin g/IU	
	May	Novem ber	May	Novemb er	May	Novemb er	May	Novemb er
Euphrates River	1.2 \pm 0.1 *	1.3 \pm 0.1 *	8.5 \pm *	8.8 \pm 0.1 *	31.3 \pm 0.9	35.7 \pm 0.7 *	11.0 \pm 0.1	11.9 \pm 0.1 *
Drainage	1.2 \pm 0.2	1.7 \pm 0.03 *	8.3 \pm 0.1	12.9 \pm 0.1 *	31.0 \pm 0.6	45.3 \pm 0.3 *	11.1 \pm 0.1	15.8 \pm 0.2 *
Wells	1.2 \pm 0.3	1.5 \pm 0.03 *	8.3 \pm 0.1	10.0 \pm 0.1 *	31.3 \pm 0.3	39.3 \pm 0.3 *	11.1 \pm 0.2	13.8 \pm 0.2 *

*Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan multiple ranges test at significant level of 5%.

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